Space Qualification of Photonic Devices

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ABSTRACT

Key optical elements for space qualification plans of photonic devices were overviewed. Device parameters and qualifying procedures will be discussed to assure the reliability of the newly developed photonic devices needed for potential usage in space environments. The goal is to gradually establish enough data to develop a space qualification plan for devices using empirical and numerical models to assess the lifetime degradation of the devices for long term space applications. Optical, electrical and mechanical device parameters of newly integrated photonic devices (diode lasers and detector arrays) will be presented. Monolithically integrated active pixel InGaAs detector arrays will be compared, as examples, with those hybridized with CMOS silicon multiplexers in terms of their performances and reliability. Adapting the existing fiber optical (1.55 μm) communication technology, this integration will be an ideal optoelectronic system for dual band (0.5-2.5 μm, Visible/IR) applications near room temperature for use in atmospheric gas sensing in space. For target identification on earth, however, there are concerns about the effectiveness of the device quality, reliability, and prevention of device failure in preparation for multifunctional, transportable shipboard surveillance, night vision, and emission spectroscopy in air.

Keywords: Space Qualification, Reliability, Low power, InGaAs PIN Array, InP JFETs Array.